LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Tidal Evolution and Geology

IT appears to me that the difference of opinion between Mr. George Darwin and his interpreter, Dr. Ball, is very small. Dr. Ball is careful to confine his large tides to the Eozoic rocks, and has not asserted their efficacy in Carboniferous times.

The Laurentian rocks form nearly 19 per cent. of the total known thickness of strata of all ages, and occur at the bottom of all; but we must ascend through nearly 66 per cent. of the total thickness before we reach the lowest bed of the Carboniferous period; and it is plain that Mr. Darwin's large tides may have existed (as Dr. Ball suggests) in the Eozoic period, and have become much smaller before the Carboniferous period began.

The real importance, in my opinion, of a large tide considered as a geological agent, depends upon its rise and fall, and not upon its ebb and flow. The waves of the sea, agitated by the wind, make the ocean surface a vast planing-machine, acting upon the coast-lines; and a great range of tide applies this planing-engine either twice or four times a day to every part of the coast laid bare by the rise and fall of tide. The effects must have been very serious when the day was six or eight hours long.

The claim for priority made on behalf of Kant, by the metaphysicians, must be set aside, as Kant's statement was not based on sound dynamical principles. SAMUEL HAUGHTON

Trinity College, Dublin, January 17

I WAS much interested in reading Prof. Ball's lecture in NATURE, vol. xxv. p. 79, but failed to understand the following passage on p. 81:—"*The reaction of the earth tends to increase that distance*, and to force the moon to revolve in an orbit which is continually getting larger and larger." In what sense does the reaction of the earth tend to "drive away" the moon? Will the Royal Astronomer of Ireland, or some other friend of science, be so kind as to add a few words of explanation? J. R. B.

The Remarkable White Spot on Jupiter

EARLY in the present month this singular object became obscured, so that on January 1 I could scarcely distinguish it at all, and on the 3rd, 5th, and 6th it was noted as extremely faint. The origin of the spot's disappearance was obvious. A dark mass on the north border of the great south belt (and therefore in the same latitude as the white spot) appeared on December 14; it followed the white spot 1h. 4m., according to observations by Mr. A. S. Williams at Brighton. The dark spot moved with more rapidity than the latter, and soon overtook it, so that as the former swept over it, its disappearance was complete. On January 6 the white spot was seen struggling through the south-east limits of the dark patch. On January 7 it had further freed itself, and I saw it much plainer, though it still continued somewhat faint. On January 9 it was bright, and evidently on the point of regaining its normal brilliancy. The dark patch referred to is obviously of the same character as the train of black spots visible on one of the northern belts last winter; they move with even greater velocity than the white spot, and are somewhat evanescent as regards duration. They appear to be excrescences from the surface of Jupiter, and as they near the outer envelopes, are dispersed into longitudinal bands; in fact, it is these dark spots which sustain the decided tone of the belts, for the latter show a disposition to become fainter, until reinforced by the commingling of these dark eruptions.

As to the brilliant white spot, it is an object of notable permanency; and though it failed to come generally under notice until October, 1880, it had probably been a conspicuous marking on Jupiter during the few preceding years. Certainly in 1879 it was very bright, and several times observed by Dr. F. Terby at Louvain, and Mr. J. Gledhill of Mr. Crossley's observatory, Halifax. I computed back the dates of its conjunctions with the red spot, and found the following nights in 1879-80 when it might have been well observed:—

1879, September 1
,, October 16
1879, November 29
1880, January 13

The date of November 29 is amply confirmed both by Dr. Terby and Mr. Gledhill as follows:—

1879, November 27, 5h. 40m., a brilliant white spot ("Tache brilliante et blanche") slightly east of the *f.* end of the red spot.—Terby.

1879, November 29, 6h. 30m., a bright gap into north border of the great south belt. It is situated about a quarter the distance from the middle to the *p.* end of red spot.—Gledhill.

In two days the white spot traverses an extent of longitude equivalent to half the length of the red spot, so that the above observations are quite consistent, and there can be no doubt that they relate to the curious object at present visible. Mr. Gledhill's drawing of November 29 shows the spot to be some twelve hours past conjunction with the red, so that the phenomenon probably occurred on the *morning* of November 29, which is not far from the computed time. The ensuing conjunction on January 13, 1880, is confirmed by Dr. Terby. On January 11, 6h. 16s., he saw a brilliant white spot occupying the same longitude as the *f* end of the red, which is exactly the computed place, and there can be little doubt that these white spots are identical with each other and with the white spot of to-day.

Mr. Gledhill's drawings supply other interesting facts. Thus at 6h. 45m. both on November 13 and December 8, 1879, there was a brilliant white spot or gap (in the north side of the great southern belt) about ½h. past the central meridian. These observations again conform to the positions of the present spot, which in the interval between the two dates mentioned had performed sixty-one rotations. It is curious that at periods of twenty-five days (equal November 13 – December 8 as above) the transits of the white spot recur at very nearly similar times. Mr. Gledhill's observed conjunction of November 29, 1879, compared with my own similar observations on December 24 last year proves that the white spot had completed seventeen revolutions of Jupiter in the 756 days!

If possible it is important to trace still further back the apparitions of the white spot. The special brilliancy of this object and its unique position indenting the north side of the southern belt, could hardly escape notice unless indeed the spot was temporarily obscured, as it sometimes is, when the dark patches sweep over it. This brilliant spot should have been nearly in the same longitude as the red spot on the following dates in the last half of 1878:—

July 29
September 11
October 26
December 10

Can observers furnish any additional links in the previous history of this wonderful object? W. F. DENNING

Ashley down Bristol, January 10

Fossil Insects of the Dakota Group

THERE are till now, as far as I know, no fossil insects out of the Dakota group published. Among a large number of fossils belonging to this group, and collected by Mr. Chas. H. Sternberg, some of the leaves show insect galls and mines, the latter mostly of a decided Tineid and Tortricid character. Perhaps a list of those plants may be of interest. The determination of the plants is by Mr. L. Lesquereux[1]:—*Aspidiophyllum trilobatum*, 6 specimens; *Sassafras cretaceum*, 1; *Araliopsis grossedentata*, 4; *A. cretaceum*, 2; *A. mirabile*, 4; *A. acutiloba*, 1; *A. Haskenanum*, 1; *Ficus primordialis*, 1. Mr. Sternberg informs me that this is only a partial list of his fossil plants, which were all collected in Central Kansas. Among the plants figured in the Cretaceous flora by Mr. L. Lesquereux (Hayden's "Survey," vol. vi.), I find on the following plants insect mines or galls:—*Menispermites obtusiloba, Greviopsis Heydenii, Protophyllum Sternbergii, Platanus recurvata* and *Heerii, Liquidambar integrifolium*. All from Kansas or Nebraska. Mr. F. B. Meek ("Cretaceous Invertebrata" in Hayden's Rep., vol. ix. p. xliv.) says: "The evidence respecting the exact part of the European Cretaceous series to which the Dakota group belongs

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[1] I am informnd by Mr. Lesquereux that a large number of Magnolia leaves from the Tertiary of Alaska show serpentine trails not larger than a thread running all over the leaves, apparently under the epithelium.

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is not entirely satisfactory. . . . The modern affinities of the numerous leaves of the higher types of dicotyledonous trees found in it, present a strong objection to the adoption of the conclusion that it may belong to a lower horizon than the Upper Greensand of British geologists; while its position directly below beds almost beyond doubt representing the Lower or Gray Chalk, precludes its reference to any higher stratigraphical position. Consequently, we have long regarded it as most probably representing in part, if not the whole, the Upper Greensand. . . ." As the fossils above mentioned belong to the Museum of Comparative Zoology, I hope to be able to give more detailed information upon these galls and mines.

Cambridge, Mass., January 3 H. A. HAGEN

On Combining Colour-Disks

THE paper of Lord Rayleigh in NATURE (vol. xxv. p. 64) describing experiments on colour, gives near the close a method of observing the image of colour-disks seen through an inverting prism in rapid rotation, while the disks were at rest. This recalls to mind a method somewhat similar that I have tried, that will sometimes be found convenient as well as simple: Here the image of the stationary disks is formed in a plane mirror slightly inclined to the axis around which it rotates; by properly proportioning the angle of inclination, the distances from the mirror to the eye and disks, and the sizes of the mirror and disk, it is obvious that a good combination of the colours may be effected, while the adjustment of colours is easily effected without stopping the rotation. If, as with my instrument, the clockwork is not heavy enough to give easily the desired speed when the disks are mounted on it, a much higher speed can be obtained with the light mirror: indeed, the mirror might be attached to the end of a wire resting on two supports, and rotated by unwinding a string, and thus colour combinations could be simply effected, and with cheap apparatus. Of course here, as with the inverting prism, the line of vision is inconveniently limited; but with both methods the uncertainty arising from unequal illumination of different parts of the disk may be detected by giving to the disk a slow rotation on its own plane.

CHARLES K. WEAD

University of Michigan, Ann Arbor, U.S.A.,
December 31, 1881

Sound-Producing Ants

WITH reference to the question whether ants produce sounds which are of such a pitch as to be inaudible to the human ear, I should like to make a suggestion which occurs to me, but which I have no means of carrying out practically. It is a well-known acoustical fact that two notes of high pitch sounding together produce a third whose vibrational number is the difference of the vibrational numbers of the two primary notes. If now we suppose a vibration at the rate of (say) 60,000 per second, another at the rate of 38,000 per second would give a difference note of 22,000 per second, which would be well within the range of audibility. If then we send up a note beyond the extreme limit of audibility, we shall be able to detect the presence of vibrations which exceed that of the note sent up by the highest number of vibrations of audible sound. It would be interesting to know if this has been attempted, and if the microphone can be applied to assist in the investigations.

Hirwain, Aberdare, January 10 D. M. LEWIS

Nepotism?

PLEASE, Mr. Editor, is a pet baboon (NATURE, vol. xxv. p. 217) more interesting than either a pet sparrow or a pet canary bird? Don't give rise to the suspicion that there is any nepotism in the affair! JOHN H. VAN LENNEP

Zeist, January 10

INDIAN FOSSILS.—Mr. J. W. Oliver informs us that at the Birmingham and Midland Institute there is a small collection of Siwalik fossils which, he understands, were sent some years ago from the British Museum. Prof. Prestwich writes that there is a very large and fine collection in the Oxford University Museum, presented by Dr. Falconer and Sir Proby Cantling. Prof. Prestwich will be happy to give Mr. Lydekker every facility for the examination of the specimens.

COMPRESSED AIR UPON TRAMWAYS

FEW persons unconnected with the practical working of the companies are aware of the great amount of time, labour, and money which have been devoted to the substitution of mechanical for horse-power upon tramways both in this country and abroad. The principal incentive to this exertion has been the large margin of saving which has presented itself in the light of a premium to inventors and capitalists. Motives of humanity towards the horses have also had considerable influence, especially with Parliament, and have contributed in no small degree to the legislative sanctions which have been obtained not only by particular companies, but by the tramway interest in general. In no case however that the writer is aware of, have the tramway companies themselves made any material contributions towards the solution of the problems involved. When the story of the subject comes to be written it will be found full of arguments in favour of the principle that the monopoly granted to inventors by the patent laws is nothing more than a clumsy method of spurring them to exertion, and of providing a remuneration for success which never covers the aggregate losses of failure by which the whole community have been indirectly benefited.

The fact of the horse-tramway companies having refused to assist inventors with money is fully accounted for and rendered excusable not only because they have no funds placed at their disposal by their articles of association for such a purpose, but also because the investment would have been far too speculative to have been sanctioned by the shareholders. Where the companies appear to the writer to have been at fault is that while the margin of saving as between a successful invention and horse-traction is admitted to be enormous, because the invention could hardly be said to be successful unless the margin was a large one, they have never admitted either individually or collectively that some substantial share of the saving should be the reward of the successful inventor. The writer has no hesitation in saying that if the leading companies had put the issue clearly before the inventive capacity of the engineering profession in the shape of an offer of say 30 per cent. of the actual saving in the shape of royalty to the inventor that the problem would have been solved at least six years ago. The far-stretching results of such a revolution, even within the comparatively confined area of the tramway interest, would be incalculable. Not to speak of the emancipation of the horses, the employment of capital in channels so consistent with the spirit of the age and the genius of the country as the manufacture of machinery would have economic results affecting the welfare of whole classes of the community, and the impetus given to the intramural locomotion of our large cities would go far to overcome the pressure of difficulties affecting the housing of the poor, which contribute more to the unrest of the people and the propagation of socialistic ideas than the wealthier classes are aware of. The policy of the tramway companies, however, appears to have assumed the character of a fixed determination to give nothing in return for the advantages which would accrue to them from the adoption of a successful mechanical substitute for horses. So long as they maintain this attitude the problem is likely to remain unsolved. Licensees of inventors have followed their example, and at least one case is known to the writer in which a gross breach of agreement has debarred the adoption of an invention which is notoriously efficient. Time no doubt will expose the guilty parties, and their names, instead of being honourably associated with the advance and improvement of mechanical science, will be handed down to posterity with the contempt which they deserve.

A description and illustration have already been given in these pages of a system of tramway traction by means of electricity, and this is no doubt safe in the hands of

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